10TH GRADERS ANALYTICAL SKILLS PROGRESSION IN SCIENCE USING DIAGRAPHICOM

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10th Graders Analytical Skills Progression in Science Using Diagraphicom

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Abstract

To promote equitable learning, teachers needed to innovate and enhance existing learning resources to improve learner's engagement and academic outcomes. Designing a learning resource that cater learner's academic needs is beneficial specially in distance learning. This study determined the effectiveness of a teacher-made self-learning material called Diagraphicom as an intervention in enhancing the analytical skills of grade 10 learners in Science in distance learning. Quasi-experimental research design was used in the study. The participants are 90 grade 10 learners. Participants were selected using convenient sampling. A teacher-made pretest and posttest were used to gather the data needed. Cronbach's Reliability Test result of $\alpha = 0.80$ indicated that the test is good. Mean and t-test was utilized in the data analysis. The findings of the study revealed that level of the analytical skills of both the experimental and control group before and after the implementation of the intervention are level 1 and 2 respectively. It was also found that there is a significant difference in the pretest and posttest of the experimental group. Furthermore, the experimental group's posttest differs significantly with the control group. As a result, the null hypothesis was rejected. Based on the findings, it was concluded that the Diagraphicom was effective in providing the learners with activities that can stimulate the learners' analytical skills. Moreover, the Diagraphicom was found to remarkably enhance the participant's ability in constructing and interpreting meaningful diagrams.

Keywords: Diagram intervention, Analytical skills enhancer, progressive skills intervention

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Context and Rationale

In an official statement released by the Department of Education on May 5 and July 1 2020, the department are addressing challenges brought by the COVID-19 pandemic through the Learning Continuity Plan (LCP) which is in effect for school year 2020-2021. To ensure that all learners will have access to quality basic education, Deped mandated the utilization of the different learning delivery modalities which includes modular, television-based, radio-based instruction, blended and online with the integration of Self-Learning Modules (SLMs).

With the efforts of the department in its mission of delivering education to all learners, teachers are also finding all alternatives to help learners to overcome their difficulties in adapting to the so called new normal education. This leads to the development of self - learning modules, contextualized worksheets, video and radio-recorded lessons and other supplementary materials to bridge the gap between face to face and distance learning.

Despite of the measures implemented by the department; most learners have difficulty in adapting to Modular Learning. Difficulty in adapting to the new learning styles and responsibilities at home affected learners learning outcomes (Baticulon et al, 2021). Problems faced by teachers are late or non-submission of learners' outputs, incomplete answers, some written works are answered by guardians based on handwritings, learners not responding to messages of teachers, learners' answers to questions are obviously copied from the internet and does not jive with the correct answer, anxiety and many more.

In an informal interview conducted to parents and learners during delivery and retrieval of modules and homeroom meeting, most of the reasons given include parents not knowledgeable on how to guide their children in the lessons found in the module, learners rely on the answers taken from the internet in answering their modules, learners cannot answer questions in the module without supervision, learners have lesser concentration due to distractions in the surroundings, learners are working, some learners have difficulty learning by reading alone, lack of support from relatives specially those whose parents are working abroad and are living with grandparents, too much activities in the modules given

and learners have difficulty in understanding instructions given in the weekly home learning plan. There are also those learners who need peer presence as motivation in learning.

Lastly, there are 302 feedbacks listed from the feedback forms stating that the SLMs are boring because of the lengthy texts and many written activities found in the modules. During the first quarter PTA meeting, parents relayed that their children are complaining with the numerous activities that they have to accomplish and that all of the modules need thorough reading. These instances caused the learners to find answers in the internet by typing the questions and then copy whatever answers are posted. The learners do not even check the reliability of the answers copied. These feedbacks from learners and parents lead to low output scores, delay and noncompletion of the activities given by teachers which in turn affects the academic performance.

To address the issues raised by parents and learners, teachers developed remediation materials which are short but complete enough to cover the competencies and has less activities. Also, teachers constructed written and performance assessments based on learner's capability. Advanced learners are given challenging activities while those learners struggling with their studies are given with simplified ones. However, it was observed after the second quarter that timely submission and output completeness was still low. Unreviewed answers directly copied from the internet and the comment in the feedback forms on the lengthy texts in the modules still exist.

The goal of the research is to develop a learning material that will enhance the analytical skills of learners using representation method. Transforming lengthy linear text form SLMs into learning material with lesser text but with more data representation methods which include drawings, tables, graphs, pictures, concept maps, diagrams and comic strips. The use of pictorial information instead of pure text-based is one potential avenue (Affeldt, Meinhart & Eilks, 2018) that can increase learners' responsiveness in learning.

In this manner, aside from making the wordy SLMs shorter, it will also help the learners develop their analytical skills. If the learners were able to collect relevant information, organize it in logical manner, can identify and evaluate the options and can draw

logical conclusions, then using the internet as source of answers aside from the SLMs will be helpful. Learners will not just copy the answers but analyze the conciseness and relevance of the uploaded answers and choose the best option. In this times that the learners need to rely on their own in accomplishing their modules, helping them in enhancing their analytical skills is very important specially in utilizing the internet. This will also prepare them in the competencies in the next grade levels which involves researches as this subject involves gathering relevant information online. In improving the analytical skills, developing a significant material is an aspect that must be considered in the learning process (Hernani et al., 2019).

Thus, to initiate the analytical skills of learners, it is very important to provide a motivating learning material. Learners are motivated with lessons presented using multimedia however, this strategy is a little difficult with distance learning and limitations in technology. To bridge the gap, printed learning materials with the integration of drawing, pictures, comics, diagrams and concept maps may help. In a research conducted by Samosa (2021), he found out that the use of Comics as strategic intervention material was effective in teaching biology. Another study on the use of comics in teaching science concepts (Casumpang and Enteria, 2019) states that comics had enhanced the participants inferring and communicating science process skills. The picture diagram in the comic strip has a positive effect on the performance of learners (Estacio, 2015). With the limitations in education brought by COVID-19, alternative tools of instruction which are both motivating and easy to comprehend are helpful.

Furthermore, a study entitled Critical Thinking in Philippine Education: What We Have and What We Need by Marquez (2017) revealed that critical thinking always starts with a question. Learners usually ask questions when diagrams, graphs and concept maps are included in the learning activities. Learners tend to ask more questions in activities with diagrams than with activities written in pure text form. According to Davenport (2008), relevant diagrams have the power to significantly enhance learning.

The result of this research can be used as basis of teachers in developing interventions and innovations for learners with similar difficulties. It may suggest solutions to the problems encountered by teachers related with distance learning. It can also be used during learning action cells as reference. Moreover, teachers may consider integrating the intervention in their classes as an alternative in nurturing interest of learners.

In the school level, it may provide information needed for school-based management, planning of School Improvement Plan and Annual Improvement Plan. Finally, it may contribute to the enhancement of policies and guidelines specially in giving remediation in the teaching-learning process in the future.

Action Research Questions

The study aims to determine the effectiveness of Diagraphicom as an intervention in enhancing the analytical skills of Grade 10 learners in Science in distance learning. Specifically, it seeks to answer the following:

1. What is the level of the analytical skills of the learners before and after the implementation of intervention in the experimental and control group?
2. Is there a significant difference in the pretest and posttest of the experimental group after the intervention?

H_o: There is no significant difference in the pretest and posttest of the experimental group after the intervention.

3. Is there a significant difference in the posttest between the experimental and control group?

H_o: There is no significant difference in the posttest between the experimental and control group.

Innovation, Intervention, and Strategy

Comics is an art form which is composed of images and textual devices like speech balloons, captions and onomatopoeia. This is popular in the Philippines in the late 19th and early 20th century but deteriorated when moving pictures find its way in the entertainment industry. The use of Comics as a teaching strategy is encouraged because it has the ability to develop competence, critical sense and helps to establish relationships between events while enhancing the decision-making process (Da Silva, Santos, De Araujo Bispo,2016). Pictures help the learners use their imagination which exercise their creativity. The ability of learners to interpret images improves their analysis and interpretive skills. The use of Comics in the delivery of the lesson helps the learners develop their analytical skills because the presentation of the graphics serves as practice activities that will challenge the learning interests of the learners.

Diagrams are graphic organizers used to organize information and present ideas visually. It is popularly used in all learning disciplines due to its high effectiveness in conveying ideas. The theory of connectivism argues that learners need to distinguish between important and unimportant information, as well as valid information, since there is a continuous flow of new information (Oyarzun and Conklin, 2020). In other words, knowledge is communicated through a complex combination of semiotic (meaning-making) systems to generate multimodal texts (Polias, 2016). Diagrams are excellent strategies that can be utilized under this learning theory. Examples of diagrams include venn, flowchart, maps, web and conceptual diagram or concept map.

Diagraphicom is a learning material that transforms the lesson into visual information, diagrams, short conversations (comics) with pictures, concept maps, tables and graphs. It is also an integration of worksheet, activity sheet, comics and diagrams focusing on improving the analytical skills of the learner. This process will shorten the length of texts found in the lesson which will address the feedback of learners that SLMs are boring because of lengthy texts. Diagraphicom aim to attract the attention of the learner through the images while delivering the lesson in a subtle way. It also aids in the ability of the learners to explain

meanings of nontextual information. Instructions that included diagrams led to enhanced performance in low performing learners (Davenport et al., 2008). Also, when learners are asked to draw diagrams and justify it in their outputs, it actually helps them to develop understanding (Waldrip, Prain & Carolan, 2010). The analytical skills of the learner are challenged starting from the interpretation of the visual representations up to the process of explaining and making the diagrams as end products. This happens as learners look at existing relationships, deciding on which data is correct, organizing facts, synthesizes ideas presented, coming up with well-reasoned responses on questions and making reports or research.

On the other hand, English as a second language in teaching Science will also be incorporated in the Diagraphicom by including activities that will enhance the learners' communication skills like sentence framing, metacognition, profiling, forming conclusions, defining formats and personifications. In this manner, the learners are expected to develop analytical skills like data analysis, communication, logical reasoning and research.

The parts of the Diagraphicom are as follows:

Title

This contains the quarter and week number, title of the lesson and the learning competency or objectives. It also includes the data of the learner like name and section but for the sake of the research, the name of the learner did not appear instead a code was used for confidentiality. This served as the cover page of the material and it varies depending on the lesson covered.

Introduction of the Lesson

The lesson was introduced in this part. A motivation was also included which are in the form of riddle, picture analysis, word anagram, any visual representation or a simple physical activity that ignite the interest of the learner. It can also be a short comic strip. This part also varies depending on the lesson.

Lesson

This is the section where the lesson is presented integrating the different nonlinear and graphical forms with explanations written as captions if necessary. The lesson is presented using diagrams, pictures, graphs, tables, semi-comic short conversations and illustrations. In this part, it is very important for the learner to keep track on the lesson. Tracking strategy aims to enhance the learners' ability to follow the sequence of the events or situations which is very important in enhancing the skills of the learner to interpret (Manno,2014).

Practice and Drills

This contains questions, practice activities and other drill exercises required for the learner to master. This may require the learner to draw, construct sentences, generate conclusions, or write situations showing applications of the lesson. Most of the activities or drills involve nontextual informations in the form of tables, graphs, diagrams, flow charts or concept maps. The activities in this part allow the learners to think, process the images, find explanations, formulate why-questions which is a sign of higher order thinking skills, retrack the sequence involved and trace patterns. The whole process was guided by questions posted by the teacher in the diagraphicom. In cases of learners with special needs, this part was modified to accommodate the need or learning pace of the learner. The use of short conversations in every panel which is similar with the presentation of comics improves the learning interest of learners with special needs (Arini, Choiri & Sunardi, 2017). Language strategies like profiling, composing with keywords, metacognition, framing and morphology/etymology were also integrated in this section.

Evaluation and Reflection

Evaluation is found in this part. Rubrics are also included (if the test requires a rubric). Outputs require learners to express their answers in diagrams, forms conclusions, or a simple research paper. As to the reflection, the learner may write questions, clarifications or queries that is encountered in the lesson. It is also the part where the learner expresses his reflection through drawing or writing.

The Diagraphicom was packed per lesson however the tasks were divided per day. Instructions on the divisions of tasks was found in the weekly home learning plan given together with the intervention. The Diagraphicom was given in 4 sets. The set was determined by the topic and each set was book bound separately. The intervention was implemented for 3rd quarter which runs from February 7 to April 8, 2022 based on the school calendar however the conditioning stage was done before the start of 3rd quarter. The topics covered included feedback mechanisms, nervous system, protein synthesis, mutation, evolution and population growth. An answer sheet was included in the intervention where learners can write their answers. At the end of each competency, the learners were required to submit the Diagraphicom with their answer sheets. Also, the instructions were included in the sheets that the learner accomplished per set.

The intervention was given as an additional learning material and it did not replace the SLM prescribed by DepEd. The experimental group utilized the Diagraphicom as scaffolding in developing their analytical skills.The intervention was composed of 3 stages. First was the conditioning stage which involved giving the learners activities that oriented them with the different types of diagrams. This was the part where the teacher made the learners familiar with the intervention. Second was the implementation stage. It was in this stage that the intervention was fully implemented. Lastly, was the debriefing stage. The teacher asked learners to express their sentiments and feedbacks as a whole. Also, the teacher discussed the improvements observed after the intervention.

Action Research Methods

Research Design

Quasi-experimental research design was used in the study to evaluate the causality of the intervention in the learner's analytical skills. In Quasi-experimental design, a program or intervention is tested for how well it achieves its objectives measured by a prespecified set of indicators (White and Sabarwal, 2014). It did not use randomization in selecting the

participants due to difficulty in communicating with the learners. The participants were grouped in two: the experimental and control group.

Participants and/or Other Sources of Data and Information

A total of 90 learners which was composed of 2 sections of grade 10 at Tublay School of Home Industries-main were the participants of the study. Originally, 96 were oriented but 6 participants have withdrawn in the middle of implementation due to undisclosed reasons. The 2 sections were selected using convenience sampling. This is because of the difficulty in interacting with the learners. The participants in the experimental group were the researcher's advisory class while the other section was the control group. The learners in both classes are heterogeneous in terms of academic performance.

Data Gathering Methods

Pretest and Posttest design was used in gathering the data needed in the research. A 20-item pretest and posttest were administered to determine the level of analytical skills of the learners before and after the intervention. The test includes questions that require the learners to identify, codify, organize, classify, synthesize, evaluate, reduce information into manageable components like charts, draws logical and objective conclusions. There are 3 choices in every question. Each choice corresponds to a certain level of complexity, completeness, preciseness, and difficulty in the analytical scale. The questions were based in the competencies covered in the third quarter of Science 10. Feedback forms was also included in the intervention which was used in gathering additional information needed such as perceptions of learners which can be used to support the result of the pretest and posttest.

The pretest and posttest were validated by master teachers and was reliability tested to learners in other sections prior to the conduct of the study. The Cronbach's result from the reliability test was 0.80 which means that the test is good.

Data analysis

To determine the level of analytical skills of the participants before and after the intervention, mean was used. A scale adapted from Chicago State University Competency Dictionary on analytical skills was used to interpret the level of the analytical skills of the participants. The mean was computed and scaled based on the number of levels. The description of each level is described in table 1. In determining the significant difference between the pretest and posttest of the experimental group after the intervention; and posttest between the experimental and control group, T-test was used.

Table 1

Analytical Skills Scale

Mean	Level	Description
1.0 -1.66	1	Undertakes a process of information and data collection and analysis for integration purposes. • Identifies and makes sets of information and determines their relationships. • Codifies this data to detect trends and issues in the data and information in a logical and factual manner. • Makes logical deductions from data. • Identifies a solution for resolving the problem
1.67- 2.33	2	• Collects all the relevant information and data needed to address the problem. • Organizes, classifies and synthesizes the data into fundamental issues. • From the information, identifies the most probable causes of the problem. • Reduces the information down into manageable components. • Identifies the logical outcomes from the analyses of the data collected. • Identifies the options and solutions for addressing the problems analyzed.
2.34-3.00	3	Collects, integrates and analyses all relevant data and information and reduces that information down to manageable components and/or charts, diagrams or graphs. • Identifies a number of solutions to complex problems integrating findings from several different disciplines, identifies and evaluates the various options developed and selects the most effective solution. • Draws logical and objective conclusions from the data and validates them as the prime cause and contributing causes. • Identifies a number of solutions to the problem by identifying and evaluating the various options developed and selects the most effective solution.

Ethical Issues

Prior to the conduct of the study, permission was sought from the school principal. Assent was also requested from the learners. Since the participants were minors, consent from the parents for their child's participation was also solicited during the Second homeroom PTA meeting. Parents who were not be able to attend the meeting were sent with consent letters and was informed through call or messenger. All personal information gathered which may link to the identity of the participants was treated with utmost confidentially. Names were not used instead each learner was assigned a number. The assignment of number was done randomly. The researcher ensured that gender equality was observed and no policies in the student handbook and child protection policy was violated. The participant was also free to withdraw from participating in the study anytime without any sanctions or obligation.

Discussion of Results and Reflection

Participant's Level of Analytical Skills Before and After the Use of Diagraphicom

Results show that the analytical skills level of both the experimental and control group before the intervention was level 1 and both level 2 after the intervention was administered. However, it was noted that there is a mean difference of almost 0.1 between the two groups. At the onset of the study, it was observed that the learners can gather information that can be used to support solutions to problems given but they cannot reduce the data into manageable components like tables. This makes their answers very long and sometimes mislead the main idea. They also have difficulties in making summary or outlines.

After the intervention, different improvements in the experimental and control group was noted. Significant observations in the experimental group include the ability of the learners to present idea using diagrams like showing the similarities and differences of concepts using Venn Diagram and filling up concept maps with more logical answers; summarizing concepts; presenting ideas according to relevance; classify information or data according to issues addressed; and the most important is looking at the source of the

information for reliability. Learners seldom write an answer which is taken from a post in social media.

On the other hand, improvements in the control group observed were the ability of learners to check the source of the information; identify the possible cause of a problem; collect and reduce information into components and try to predict the outcome of a suggested solution. The difference between the two groups lies in their ability to transform information into manageable components like presenting a lesson summary using bullets, graphs or tables. The control group presented their answers in long sentences and paragraphs while the experimental group created tables accompanied with short explanations.

Also, the learners in the control group have the difficulty of interpreting diagrams. When they were given an organizer to fill in with a certain lesson, the ideas were not well organized. In their ability to choose the best option or solution to a problem, the difference is negligible because both groups were arriving at almost the same answers however the control group required longer time to finish activities. The time difference in accomplishing the tasks between the two groups is a significant result because it means that the learners can grasp the lesson more quickly than the control group.

The result as shown in table 2 implies that the intervention was as effective in providing the learners with practice activities that can stimulate the learners' analytical skills. In a study conducted by Natividad (2021), teachers and learners agreed that the SLMs are effective as a teaching and learning tool in the implementation of Modular Distance Learning. Moreover, Ramos, De Guzman and Rico (2021) found that the utilization of SLMs in the time of pandemic is useful and effective. With the addition of the Diagraphicom as a strategy in helping the learners enhance their analytical skills, the difference in the means of the control and experimental group indicates that the intervention has contributed remarkably to the skills development of the participants in the experimental group.

Using graphics as a way of presenting information is an advantageous strategy and effective in improving analytical thinking skills (Sartika and Pendidikan, 2017). Regardless of

learning modality, the skills of learners can be developed through careful planning and preparation of learning materials. The appropriateness of the learning material is very important. This result confirms with Areesophonpichet (2013) research findings that the design of teaching plans and the sequencing of assignment plans both have effects upon the development processes of students' analytical thinking skills. In distance learning where the teacher cannot directly supervise learners, the development processes in the learner's skills were affected since most learners were dependent on the teacher for instruction. It is very important to address the needs of learners in any possible ways.

Table 2

Analytical Skills Level of the Experimental and Control Group Before and After the Intervention

Learner's Group	Mean	Mean Difference	Analytical Skills Level
Control			
Before	1.581	0.117	**Level 1**
After	1.698		**Level 2**
Experimental			
Before	1.647	0.203	**Level 1**
After	1.850		**Level 2**

Pretest and Posttest of the Experimental Group

As shown in table 3, there is a significant difference in the test results of the participants as the p value is less than the 5% level of significance. This result lead to the rejection of the null hypothesis. The intervention has greatly affected the performance of the experimental group leading to higher posttest result. Based on the reflections part of the intervention, the participants wrote that the activities in the Diagraphicom initiated them to think and figure out possible solutions to the problems given. The illustrations helped them

understand the lessons better and the boredom in reading lengthy explanations were minimized.

Also, as the participants were get used to the format of the intervention which made them become familiar with the process of interpreting the diagrams and relating it to the questions asked in the evaluation. According to Sartika et al. (2017), analytical thinking skills are trained skills. This skill can be improved through a particular learning model or learning strategy. As the participants utilize the intervention, they were able to see how the concepts in the SLMs were reduced into manageable components. The lengthy texts in the SLMs were transformed in the Diagraphicom into a single diagram.

However, before the concepts can be transformed into diagrams, the ideas need to be organized, classified and synthesized into fundamental concepts. As stated by Fitriyana, Marfuatun and Priyambodo (2019), to promote analytical thinking skills, learners should be able to determine the relevant or important parts of information, the ways in which the parts of an information are configured, and the underlying purpose of those information. For these skills to be enhanced, teachers need to provide an opportunity to the learners. In a study conducted by Pecjaka and Pircb (2018), the results showed that skills of students can be developed by systematically training them to apply the skills but most importantly, the learning environment should encourage the learners to use their skills. The SLMs are designed to cater all learning domains. When this is combined with other modules, learners can master a vast body of knowledge or complex process (Benito, Bantulo & Haudar, 2022).

With the design of the Diagraphicom, it can serve as augmentation to the SLMs in helping the learners develop their ability to collect, process, organize, classify, synthesize, and reduce down information into manageable components. The features of the Diagraphicom can help the learners to analyze and transform information into diagrams. While doing these, the learner's analytical skills are honed.

Table 3

Statistical Analysis of the Pretest and Posttest of the Experimental Group

	Mean	P value	Decision
Pretest	1.75	0.0006***	Reject null hypothesis
Posttest	1.85		

***p<0.001

Posttest Difference of the Participants

In the posttest of the experimental and control group, p> 0.01 which means that the intervention implemented has an effect on the posttest of the experimental group. In table 4, it is shown that the posttest of the participants who utilized the Diagraphicom is significantly higher than those who did not use the intervention. The null hypothesis is therefore rejected. To support this, a medium (d= 0.53) effect size was also calculated using Cohen's d. The effect size indicates how powerful the intervention works (Macleod, 2019). Based on the statistical analysis, Diagraphicom has an impact on the analytical skills performance of the participants. This implies that the intervention can be used to enhance the analytical skills of learners.

This result may be attributed to the feature of the intervention as it is focused on the aspects of how analytical skills may be developed. This is supported by the conclusion of Yulina et al. (2019) that material significance is an aspect that must be developed to improve analytical thinking skills in the learning process. In another study (Cariño, 2019), results showed that the analytical skills of the respondents are fairly satisfactory because of minimal exposure to activities related to analytical skills. To attain higher level of this skill, activities related to the use of the skill should be regularly practiced.

Moreover, a group of researchers (Chonkaew, Sukhummek and Faikhamta, 2016) were successful in developing the analytical thinking abilities of the learners towards science by integrating problem-based learning to the usual class set-up. The effect size of the intervention which is 0.5 might be affected by the length of time that the intervention was

given to the learners. Developing a skill involves longer time of exposure but the intervention was given for 7 weeks only due to the change in pandemic level which required learners to attend limited face to face classes on the supposed 8-9nth week of implementation.

Nevertheless, the impact of the intervention was evident in the participant's posttest mean. During the debriefing stage where the participants were asked to tell their experiences, they mentioned that at first, the intervention was confusing but as they go through the other parts, the lessons were clearer and easier to understand because of the illustrations. They claimed that the lessons seemed to be shorter due to lesser number of pages and sentences. The layout of the intervention eliminated the notion of the participants that the lesson is difficult. A significant feedback is quoted as follows:

> Thank you very much maam for the Diagraphicom. It helped me a lot in answering my summative tests. Actually, it did not just help, its fun doing the activities. It's challenging but enjoyable. I hope the other modules can be like the Diagraphicom.

Another participant said:

> The Diagraphicom is much easier to understand because it points to or tells the important part of the lesson. It is not complicated. It is also colorful and the short important details like the arrows showing complete sequence of events help me understand the lesson unlike having to read a lot of paragraph with illustrations that are difficult to understand. Explanations are also short and the letter does not make me sleepy.

Lastly,

> I realized that diagrams are easier to understand than long explanations. Before, I don't like graphs and Venn diagrams and concept maps because at first glance, it seems very complicated but now, I fully understand how these drawings work. I also learned how to make a simple diagram and how to interpret a graph because of the Diagraphicom. The Diagraphicom made me realize the meaning of the quote a picture is worth a thousand words.

Table 4

T-test of the Participants Posttest

Groups	Mean	P value	Decision
Controlled	33.98	0.014*	Reject null hypothesis
Experimental	37		

*p>0.05

Reflection

The difficulties of learners are the challenges that brings the best out of being a teacher. When the researcher received outputs with obviously copied answers from one learner to another and discovered that the answers were taken from the internet, the initial reaction was really frustrating. However, on second thought, learners are also creatures trying to survive in this world. For them, typing the question in the search tab and finding a website with an answer is a big relief. Getting furious with the circumstance is normal but not a wise choice. The situation is actually an avenue for the teacher to find a solution. Being a teacher and researcher is different.

A teacher designs a solution to the problem to help the learners to become a better individual because in the teacher's heart, it is a responsibility to guide and mold these learners to become critical and analytical thinkers. As a researcher, the interest is focused on the effectiveness of the intervention in solving the problem. The outcome of this research is fulfilling because the researcher has helped the learners alleviate their difficulties in distance learning. She has seen the interest of the learners in doing their parts as learners.

The response of the learners inspired her to continue making interventions that can help them in learning. When the participants in the experimental grouped received one issue of the intervention where she cut pictures and pasted it on the pages, they sent messages saying that they really appreciated her effort in doing it for 50 learners. From that time on,

she observed that the submission rate of her learners (experimental group) increased. Most of the activities were also answered completely.

The intervention somehow solved her problem on delayed or non-submission of outputs and failure rate. She realized that if the learners feel that they are given importance, they reciprocate the attention. The success of the research is due to the cooperation and participation of the learners, the assistance of the school heads, encouragement from colleagues, and finally, the financial and technical support from Deped.

In the coming years, even if the learning modality is face to face, she can still use the Diagraphicom because the same books and the same competencies will still be used. The Diagraphicom can be transformed into power point presentations which can be flashed during discussions. The diagrams can be used as a learning aid in the classroom. It can also be given to learners who are absent and those participating in other activities like the athletes.

Conclusions and Recommendations

Based on the results of the study, the following conclusions were derived:

1. The level of the analytical skills of the participants before the intervention is level 1 and improved to level 2 after the intervention.
2. There is a significant difference in the pretest and posttest of the experimental group after the intervention was given.
3. There is a significant difference in the posttest between the experimental and control group.

Recommendations from the study are:

1. The diagraphicom may be used by teachers to stimulate learner's analytical skills specially in science 10;
2. The diagraphicom may be utilized to enhance the learner's ability in constructing and interpreting meaningful charts or diagrams.;
3. The intervention may be used to enhance the analytical skills of learners in Science 10 specially in representing information in non-textual forms.

4. The Diagraphicom can be modified to be utilized by other specializations in addressing problems in least learned competencies.

4. The intervention may be digitized when used during face to face classes.

Action Plan

The result of the research will be disseminated to the school heads, department heads, and teachers during In-service trainings and LAC sessions to give them an idea in the possibility of integrating the intervention in their lessons. It will also be shared during research conferences in the school, district, division and in any other conferences as possible as it may be a source of information for other educators in making intervention, crafting solutions in the teaching-learning process and others. The result will also be discussed during the General Parents Teachers Association Assembly and other stakeholders' meetings to inform them of the effect of the intervention. If possible and if resources will be available, the result will be submitted to a newspaper or journal company for publication. Blog can also be created to upload the result online if permitted.

The findings of the study will be submitted to the planning committee for possible integration in planning for teachers' seminars on development of instructional materials. Also, teachers will be encouraged to adopt the intervention in delivering their lessons specially in distance learning. The intervention will also be utilized in the coming school years as supplementary material. The results of the research will be used as basis in planning and designing innovations, basic and action researches to be conducted in the future. The findings of the study will also be utilized as source of information for other individuals who are interested in conducting researches.

Objectives	Activity/ Task	Strategy	Timeline	Resources
A. Dissemination - To present the research findings to school heads, department heads, teachers, learners, parents, researchers and other stakeholders	**1. School Activities** Learning Action Cells (LAC) In-Service Training (INSET) School Governance Councils (SGCs) Homeroom Meetings PTA General Assembly	• Oral presentations • Video presentations • Poster presentations	August to December	Researcher Tarpaulin Bond papers Glossy papers
	2. District/Division Activities Seminars Research conferences and fora	Oral presentations • Video presentations • Poster presentations	August to December	Researcher Tarpaulin Bond papers Glossy papers
	3. Region / National / International Research Conferences Publish in online journals/publications	Oral presentations Video/online presentations • Poster presentations	TBD	Researcher
B. Utilization	Reproduction of the hard copies for wider use	Photocopy and Bookbinding	July to December	Researcher Bond paper Binder Ink Morocco Paper
	Conversion of the intervention into power point or any interactive format	Ask assistance from ICT experts on gaming or online apps.	July, 2022 to June 2023	MS word Online Apps

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Financial Report

Activity A. Supplies and Materials	Item	Unit	Quantity	Estimated Cost	Total Estimated Cost	Actual Cost	Total Actual Cost
Implementation of the study and preparation of research paper, instructional Materials/Worksheets and other documents	A4 bond paper	ream	20	250.00	5,000.00	275.00	5,500.00
	A4 folder Tagboard with fastener	pc	20	20.00	400.00	21.50	430.00
	Printer Ink (black)	bottle	10	300.00	3,000.00	320.00	3,200.00
	Printer Ink (cyan)	Bottle	3	300.00	900.00	310.00	930.00
	Printer Ink (magenta)	Bottle	3	30.00	900.00	310.00	930.00
	Printer Ink (yellow)	bottle	3	300.00	900.00	310.00	930.00
	USB Flash Drive	pc	1	1,000.00	1,000.00	1,125.00	1,125.00
	Staple wire	box	30	50.00	1,500.00	32.00	1,600.00
	Board Paper	pc	150	6.00	900.00	5.00	750.00
Submission of First Tranche Deliverables with wet signatures	Courier/Private Vehicle		1	100.00	100.00	100.00	100.00
C. Food and other incurred expenses during the conduct of research							
D. Reproduction, Printing and Binding Cost							
E. Communication Expenses for the Implementation/ Conduct of the Study							
Validation of Instruments	Load of Validators/Experts	card	5	300.00	1,500.00	300.00	1,500.00
Implementation of the study - Data Gathering /Collection, Preparation and submission of research papers and other documents	Regular Load of proponent	Card	6	500.00	3,000.00	500.00	3,000.00
	Internet Load of proponent	card	6	500.00	3,000.00	500.00	3,000.00
F. Other Expenses							
					22,100.00		**22,995.00**

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